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Device and method for application of a gluing system

The present invention relates to a device for separate application of at least two components, such as a resin component and a hardener component, constituting a gluing system, onto a substrate, and an application method wherein said device is used.

Prior art

Separate application of the components of a gluing system, such as resin and harder components, is known in the art of gluing and offers the advantages of providing the components applied on to the substrate in a not thoroughly mixed condition. The actual mixing of the components applied is obtained in the further processing of the substrate, such as the pressing of two or more such substrates together, allowing for a longer period of time to lapse between application and pressing, without an undesired extent of curing occuring during said period. Also, since the components are separated in the application device the pot life of the gluing system will be markedly extended, and the risk of clogging will be brought to a minimum.

Sequential application in the form of strands of resin and hardener components by means of an application device comprising two independently mounted tubes, cf. SE-373 525, having a row of orifices through which the resin and hardener components are separately spread after each other on to the substrate, has been used in the prior art in the case of application of phenolic resorcinol gluing systems. This type of application results in more or less random distribution of the strands of one component in relation to the strands of the other on to the substrate.

Another method of applying resin and hardener components is a special type of curtain application, e g EP 286 939 B1.

However, in this method a large surface area of the components are exposed to the surrounding atmosphere, leading to increased evaporation of the water contained in the components of the gluing system. Accordingly, this incurs a reduced period of time from the application of the components to application of pressure for pressing, which is a disadvantage when gluing large wooden beams, for instance.

Further, in the case of curtain application, it is hard to prevent the applied components from dripping off from the lamella when the lamella is turned 90° after the application, which is often necessary since the pressing equipments are often constructed such that the pressure is applied horizontally, ie., the glue joints will be vertical.

Thus, this method of application is more sensitive to variations in viscosity than the strand application method.

According to the present invention the strands of resin and hardener components, respectively, are applied uniformly after each other so that essentially continuous contact of each strand of one component with each corresponding strand of the other component(s) is achieved throughout the length of the strands, whereby the above-mentioned problems to a great extent are overcome. That is, the later applied strands of one component will normally substantially overlap the corresponding strands of the previously applied component(s). Thereby, a relatively smaller strand, normally the hardener component, can be brought to lie substantially within the width of a larger strand, e g, on top of, or under a larger strand, depending on the order of application. The strands of one component can also be applied in such close proximity to the adjacent similar strands so that, when applied to the substrate, said strands form an essentially coherent liquid mass, on to which mass, subsequently, an essentially coherent mass of a second component can be formed in the same manner. With the device according to the present invention the strands can be applied safely and carefully at the accurate position on the substrate.

As used here, the term "strand" also comprehends the meaning of the term "ribbon", also conventionally used in the art, and any other like term.

Brief description of the drawings

In Fig. 1, an embodiment of the device according to the invention to be used with two components, comprising two hollow members, 1 and 2, with a short c/c distance, is depicted.

In Fig. 2, an embodiment of the device according to the invention to be used with two or three different components, comprising three hollow members, 1, 2 and 3, is shown.

Fig. 3 illustrates an embodiment having four hollow members, 1, 2, 3 and 4.

Fig. 4 shows a view of an embodiment with four hollow members separated by a larger distance than in Fig. 3.

In the Figures, the strands are designated by teh reference numeral 10, and the letters a, b, c, and d, respectively, are used to denote details pertaining to the hollow member 1, 2, 3, and 4, respectively.

Each hollow member is provided with an inlet 9, through which the respective component is supplied. The device comprises at least two hollow members having a multitude of small holes, 6, the members being fixed to each other in parallel by means of fixation means, forming a unit. The longitudinal axes of the hollow members are placed substantially perpendicularly to the machine direction of the device with a spacing between said members in said direction. The distance(s) between said members can be adjusted.

The small holes 6 of the hollow members are facing the substrate 8. Said holes constitute orifices for resin and hardener component, respectively, through which the components flow during application. At least one hollow member for each of

the two above-mentioned components is provided in the device. Additional hollow members for application of the same or other additional desired components can also be provided in the device. In such a unit each of the holes in one of the members are aligned, in the machine direction, with the holes located in the corresponding position in each of the other member(s).

According to one embodiment of the invention, there is provided a device, by means of which the components can be prevented from falling onto the edges of the substrate which are not to be glued, and thereby eliminate any fauling or other negative effects resulting from the components contacting undesired areas of the substrate. Thereby, also the glue waste is reduced. In this embodiment the device is provided with guiding means (not shown), as conventionally used in the art. Said guiding means, which is held in contact with the contour of the substrate, ie., the side edges of the substrate in the direction of motion, is connected to the unit, which in turn is mounted moveably in the cross-direction of the device, whereby a contour-following movement of the unit comprising the hollow members during the application of the components is established. The substrates used together with this embodiment can be somewhat curved or twisted while the above described advantages still are obtained.

The orifices of each member can be at a distance of 2-15 mm, suitably 2-5 mm from each other, depending on the specific substrate to which glue is to be applied. The diameter of said holes can range from 1-10 mm, suitably 2-5 mm. A suitable substrate can, for instance, be a wooden lamella. Other substrates that can be used can be comprised of, for example, metal, plastic, or composite material. If desired, by selection of the proper distances and flow rates, the strands of any given component can be made to coalesce to an essentially coherent mass.

Suitable amounts of the components to be applied are in the range of 200-500 g/m2, depending, inter alia, on the feeding rate. At feeding rates below 30 m/min difficulties in dosage

are likely to be encountered due to discontinuous strands emanating from the orifices (dripping). A suitable feeding speed of the substrates is contemplated to be comprised within the interval of 30-250 m/min.

Thus, the device and method according to the present invention offer many advantages, such as, for example, reduced glue waste, and improved working environment during application, the possibility of gluing substrates which are sensitive to one of the components used, and also the benefits of a volume-effective system.

Detailed description of the invention

With reference to Fig. 1, a device comprising 2 hollow members, 1 and 2, one for resin and the other for hardener components, is shown.
The flow rates of the two components are adjusted by means of two pumps (not shown).

The holes 6 of the respective hollow members, from which the respective components are applied to the substrate, can be formed directly in the hollow member and/or in a nozzle plate as represented by reference numeral 5. Depending on the distance between the hollow members, two or more of the members can have a common nozzle plate 5, as shown in Figures 1, 2, and 3. A common nozzle plate is suitable when the centre to centre distances between the members are relatively short, eg. 5-40 mm.

In Fig. 2, an embodiment such as depicted in Fig.1 is shown, with the exception of that in the present embodiment three hollow members, 1, 2 and 3, are being used, one of which members can be used for the resin component, a second for the hardener component, and a third for hardener additives, such as for example an accelerator, respectively. This embodiment could also be used for application of only two components, such as resin-hardener-resin, for example, or resin and hardener together with a third component other than the accelerator.

Fig. 3 shows another embodiment wherein four hollow members, 1, 2, 3 and 4, is used for the application of, in the following order; glue, hardener, a hardener additive, such as an accelerator, and finally, glue again.

With reference to Fig.4, an embodiment wherein the distance centre to centre between the hollow members is greater than in Fig. 3 is shown. In this embodiment separate nozzle plates, 5a-d, are used. Here, instead of fixation means 7, fixation means 11 and 12 are used, which allow for regulation of the individual distance between said members.

The distance between the centres of the hollow members is dependent on the method of feeding the components to the members, a few examples of which will be described hereinafter, and the number of members used, and can range from about 5 to 900 mm.

In the case of separate continuous recirculation of the respective components, the excessive amounts of the components not applied to the substrate, collected in the respective collecting trays (not shown) positioned under the hollow members, are directed back to the respective hollow member by means of pumping, together with the components feeded from the supply tanks. Thus, the components are continuously running from the respective members. Here, a larger distance, such as about 300 to 900 mm, is required in order to prevent any splatter of the first component from the front of a lamella to reach in to the collecting tray of the other component as mentioned above.

In the case of the so called start/stop operation of the pumping in order to feed the components to the hollow members, there are two different types; firstly, a simple type, and secondly, a more elaborate one. In the first type the pumping of the respective component is switched on shortly before the front of the lamella reaches the respective hollow member, and then shortly after the passage, is switched off again. The

second type is based on continuous circulation by means of pumping of the components in different circulation lines, from which lines the respective components are drained to the hollow members by means of 3-way valves. This latter method makes the start and stop of the application of the components more instant, due to the continuous pressure maintained in the circulating lines. The amount of the components not falling onto the substrate in the start/stop operation mode will in either case constitute the glue waste. In the former type said waste will typically be of the order 2-4 %, and in the latter even less.

From a working place environmental consideration, the start/stop operation is normally preferred, since any undesired emissions from the gluing system components in the respective collecting trays are reduced. Also, by not having the components continiuously running from the hollow members, any such emissions are reduced.

In case of the start/stop operation, the distance between the centres of adjacent hollow members can be reduced to 5 mm, whereby the equipment can be made relatively small and easy to adjust to already existing manufacturing lines.

The short distance will also improve the accuracy of the application according to the present invention.

Thus, as an example, in the case of an embodiment of the invention having four hollow members, as shown in Fig. 3 and 4, a suitable distance from the centre of the one outer hollow member to the centre of the other outer member (ie, 1 and 4 in the figures) is in the range of about from 15 to 900 mm. With only two members, as shown in Fig. 1, the distance from centre to centre is from about 5 to 900 mm, a suitable range being 40 to 300 mm. In any case, for practical considerations, the total distance should not exceed about 900 mm.

By the use of guiding means in the application according to the invention, one avoids the spreading of any of the components on

the outer surfaces of and the amount of waste, or the need for the collecting and/or recirculation of any excessive volumes of the components used falling outside the substrate is thereby reduced to a minimum.

The guiding means can for example be comprised of guiding plates, which are mounted on a common axis with the distance between said guiding plates being adjustable in order to match different width of substrates used.

The holes of the hollow members can be covered from inside by means of a rod-shaped device, operated from outside, that can be brought into said member from the end thereof, parallel to the longitudinal axis thereof, and locked in the desired position in order to adjust the number of the open holes to the width of the specific substrate. The way of regulating the width used of the hollow members to the width of the substrate is not critical and can be accomplished in any suitable manner.

The order of application of the resin and hardener components, respectively, is not critical and can be chosen as appropriate depending on the substrate, the specific components used, the subsequent processing, and the desired characteristics of the ultimate product. By using this device hardeners comprising aggressive acids could be used since they can be prevented from getting into direct contact with the substrate. For example, this can be achieved by the application of the sequence of resin-hardener-resin, thereby securing the contact of the substrate with only the resin component, even when gluing said substrate together with another piece of substrate not provided with glue.

Also, when using a component comprising a substance which desirably should be prevented from being emitted into the atmosphere, or into a specific surrounding environment for any reason, such as for example a volatile acid in the hardener component, such component can suitably be applied followed by at least one other component covering the component comprising the substance to be prevented from being emitted. For instance,

in case of application of a gluing system comprising a resin component and a hardener component, the latter of which comprises a volatile acid, which acid not necessarily must be prevented from contacting the substrate, a suitable order of application would be the hardener component first, which thereafter is covered with the resin component.

Examples of gluing systems which can be used together with the device according to the present invention are urea-formaldehyde, melamine-urea-formaldehyde, phenol-resorcinol-formaldehyde, emulsion polymer isocyanate, two component polyvinyl acetate, two component polyurethane gluing systems.

The device according to the present invention can, for example, advantageously be used in a method of separate application of resin and hardener components of an amino resin gluing system wherein both component are applied in the form of strands in optional order of application, wherein the first applied component optionally can coalesce to form an essentially continuous layer thereof, onto which the other component is applied.

Another method wherein the present device suitably can be used is a mthod comprising separate application of resin and hardener components of an expandable gluing system in the form of strands, wherein said hardener component is acidic, and the resin component comprises one or more gas generating substance capable of forming a gas when contacted with said hardener component.

While the present invention has been described with reference to embodiments wherein the substrate is being feeded in the machine direction under the unit comprising the hollow members, the converse mode of operation is also concievable within the scope of the appended claims, i e, the substrate could be immobile with the unit passing above it during application of the components.

Claims

1. Device for application of a gluing system of at least two components, such as a resin component and a hardener component, c h a r a c t e r i z e d in that it comprises a unit of at least two hollow members, at least one member for each component, provided with a number of orifices, from which orifices in each member the respective component is applied to a substrate below said hollow members, wherein the hollow members are connected to each other, said members being positioned above the plane of application, wherein each of the holes in one of the members are aligned in the machine direction with the corresponding holes in the other member(s), so that there is essentially continuous contact between said strands of the different components throughout the length of the strands.

2. Device according to claim 1, c h a r a c t e r i z e d in that the substrate is fed through the device during application of the components.

3. Device according to claim 1 or 2, c h a r a c t e r i z e d in that the supply system is a start/stop system and/or circulating system.

4. Device according to any of the previous claims, c h a r a c t e r i z e d in that the unit is provided with guiding means connected to the unit, which means during application engage with the edge contour of the substrate in the machine direction, the unit being held movably in the cross machine direction.

5. Device according to any of the previous claims, c h a r a c t e r i z e d in that the distance centre to centre betwewen the hollow members is from about 5 mm to about 900 mm, provided that the total distance, centre to centre, between the two most distant hollow members is no more than about 900 mm.

6. Device according to any of the previous claims, c h a r a c t e r i z e d in that said members and said holes in said members are arranged so that the later applied strands of one component substantially overlap the corresponding strands of the previously applied component(s).

7. Method for applying a gluing system of at least two components, such as a resin component and a hardener component, in the form of strands after each other, onto a substrate, c h a r a c t e r i z e d in that it comprises application of the respective components along the substrate by means of a unit of at least two hollow members, at least one member for each component used, provided with a number of orifices, from which orifices in each member the respective component is applied to a substrate below said hollow members, wherein the hollow members are connected to each other by fixation means, and positioned above the plane of application, wherein each of the holes in one of the members are aligned in the machine direction with the corresponding holes in the other member(s), whereby said components in a controlled manner separately are applied in the form of strands onto said substrate, wherein the corresponding strands of components is in essentially continuous contact with each other throughout the length of the strands.

8. Method according to claim 7, c h a r a c t e r i z e d in that the substrate is fed under the hollow members through the device.

9. Method according to claim 7 or 8, c h a r a c t e r i z e d in that guiding means are used in the device, which means are connected to the unit and engaging with the edge contour of the substrate in the machine direction during application of the components along the substrate, and that the unit is held movably in the cross machine direction, whereby any undesired application of the gluing system to the sides of the substrate is prevented, and the glue waste is reduced.

10. Method according to any of the claims 7 to 9, c h a r a c t e r i z e d in that the the later applied strands of one component substantially overlap the corresponding previously applied strands of the other component(s).

ABSTRACT

A device for separate application in the form of strands, of at least two components, such as a resin component and a hardener component, constituting a gluing system, onto a substrate, and an application method wherein said device is used, is disclosed.

Fig. 1

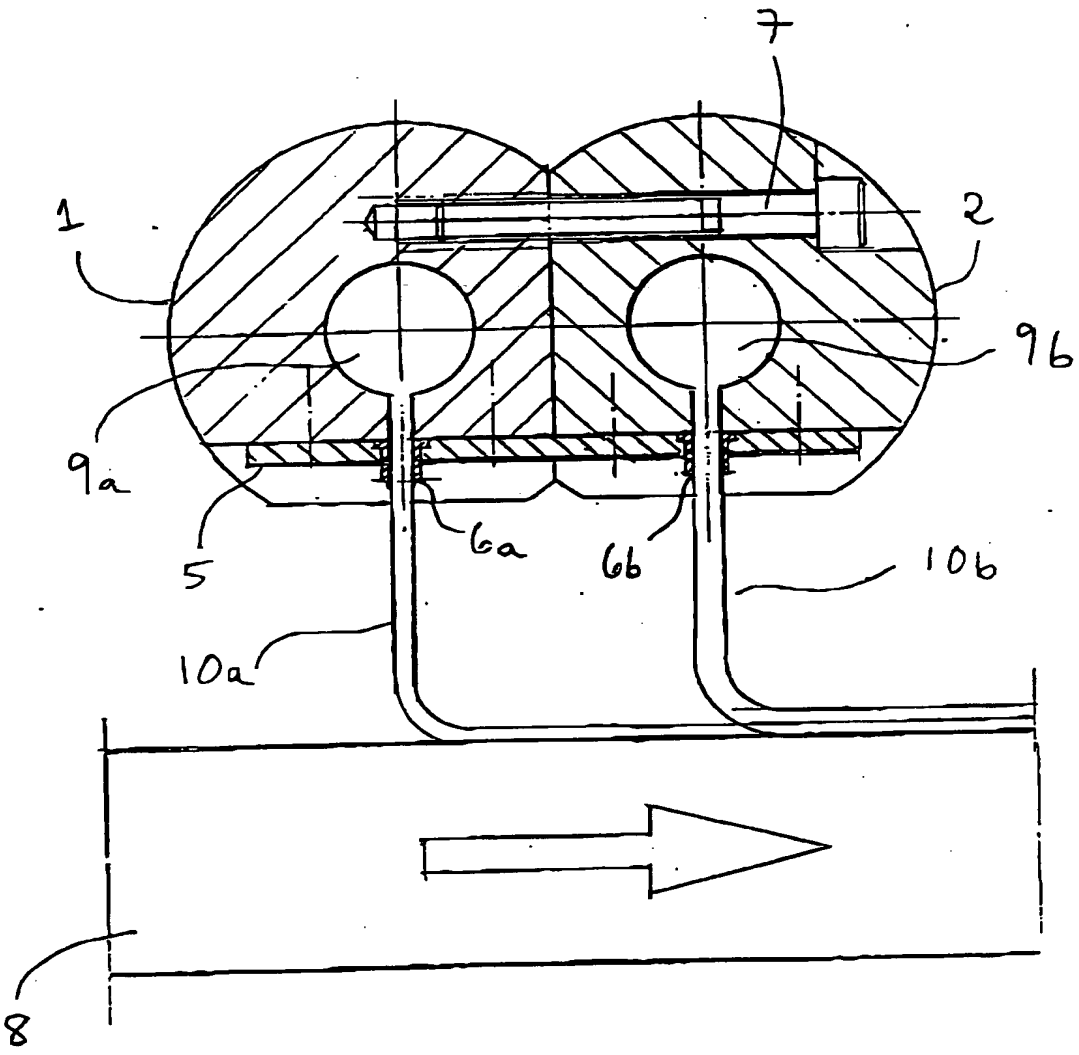


Fig 2

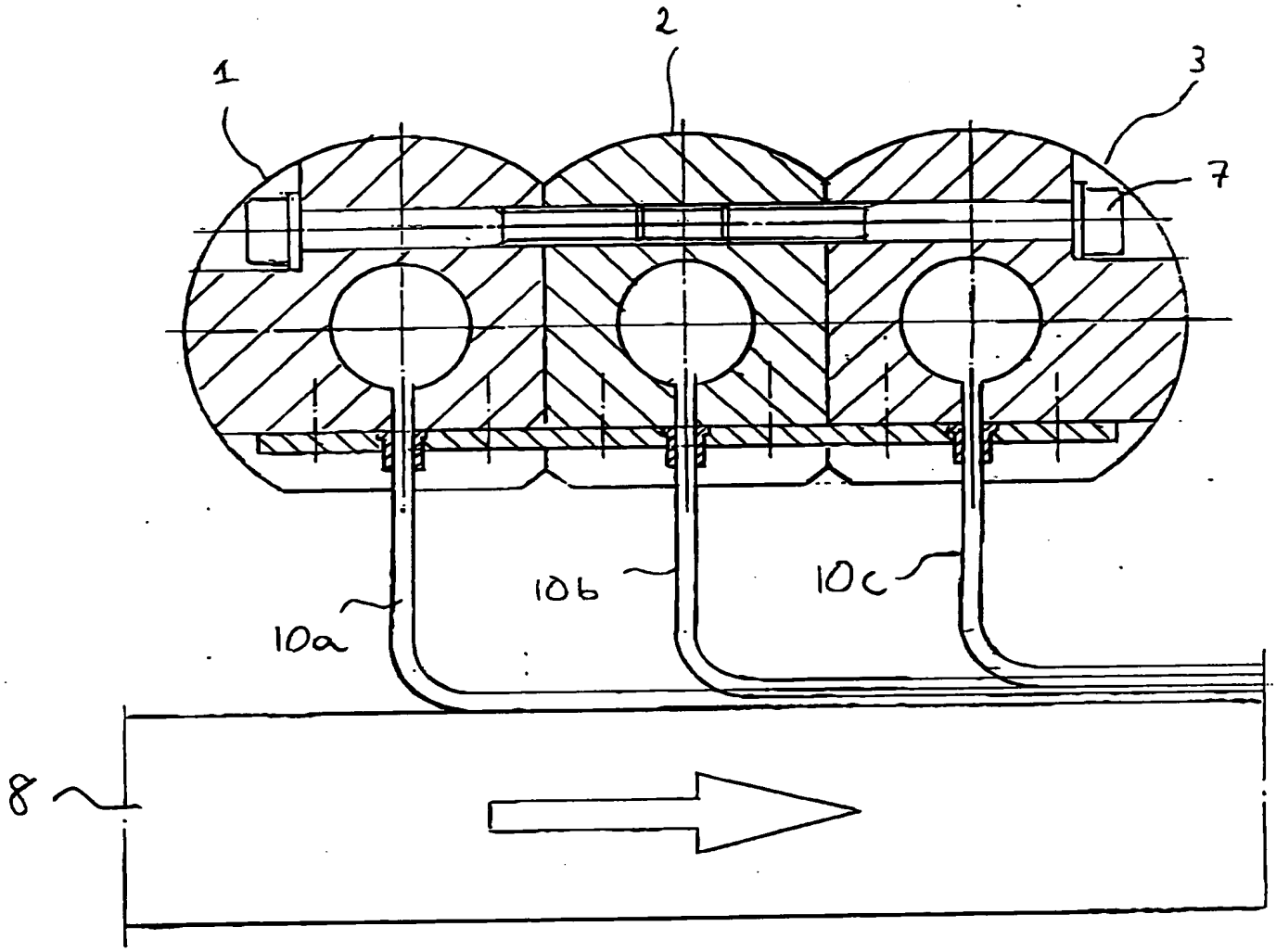
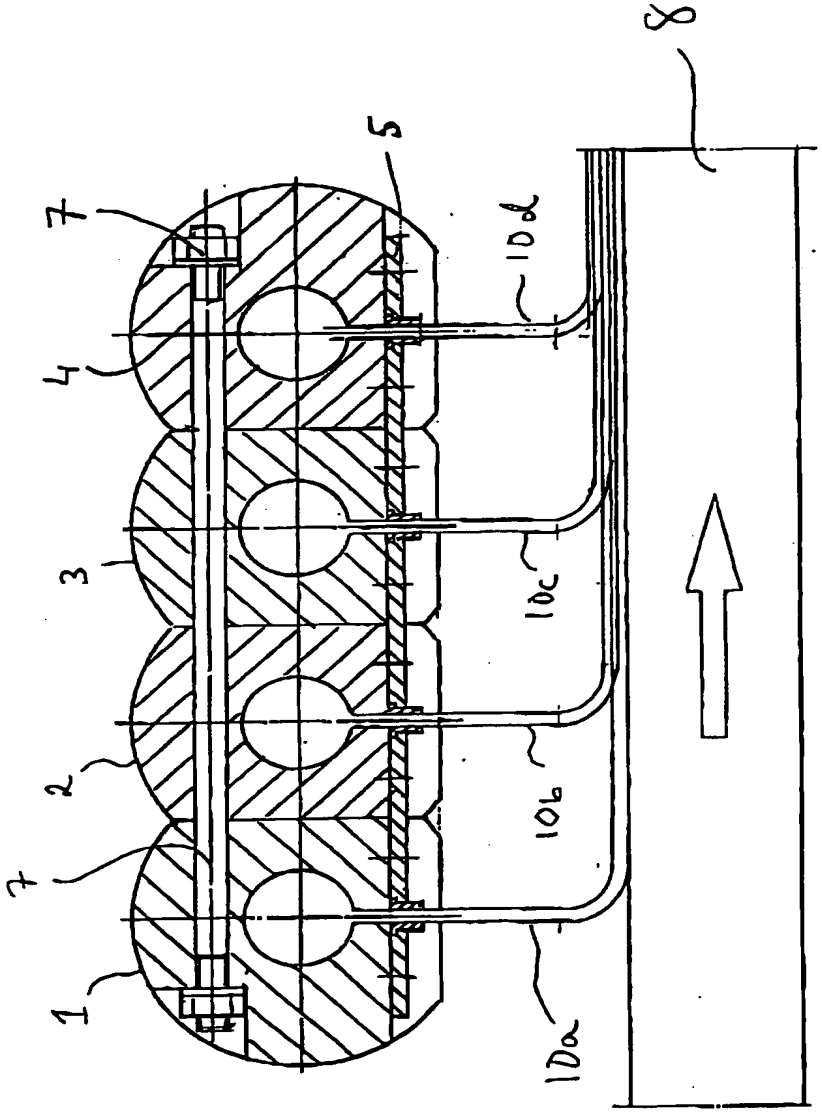


Fig 3



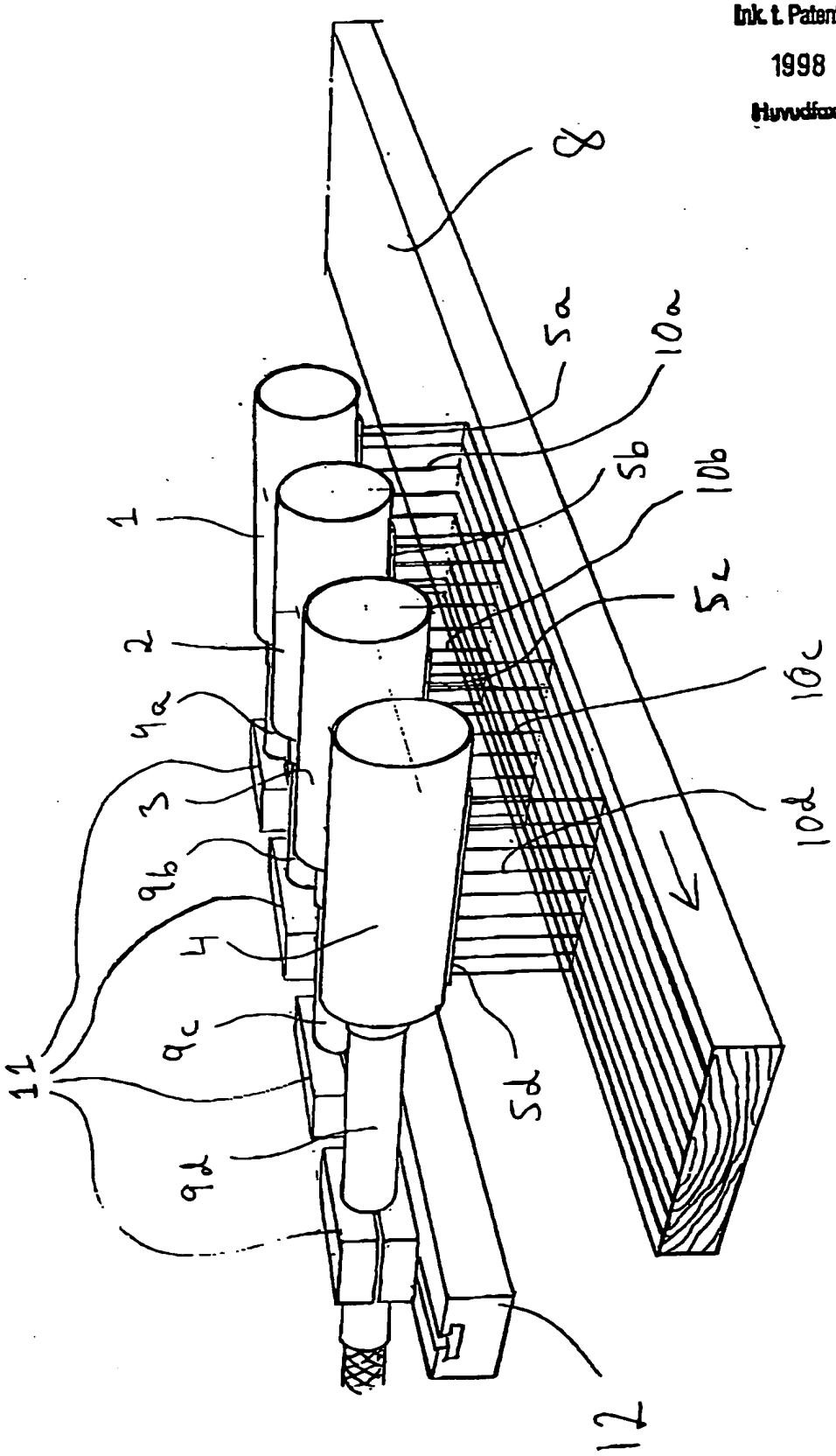


Fig 4